CLEAN ENERGY CANADA

SUBMISSION

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Charting a path for the decarbonization of medium and heavy duty vehicles in Canada

Clean Energy Canada is a climate and clean energy program within the Morris J. Wosk Centre for Dialogue at Simon Fraser University.

We are pleased to submit these comments as part of the Government of Canada's consultations on "Heavy-duty vehicles and engines in Canada: transitioning to a zero-emission future". Our comments focus on a subset of the questions for which Environment and Climate Change Canada (ECCC) is soliciting feedback, outlined below.

Clean Energy Canada will be conducting work related to the decarbonization of medium- and heavy-duty vehicles (MHDVs) in 2022, and is interested in taking part in future consultations and working with the federal government to advance effective policy to meet our targets.

Summary of Recommendations

To achieve Canada's goals, the federal government **must implement a comprehensive package of policies that prioritizes the deployment of zero-emission medium- and heavy-duty vehicles (ZE-MHDVs), including a sales mandate that aligns with the California Advanced Clean Trucks (ACT) Regulation.**

Specifically, Clean Energy Canada recommends:

1) **Sales mandate:** Canada must establish a sales mandate starting with model year 2025, with targets that align with the California ACT Regulation, with the exception of Class 7-8 tractor trucks;
    - Use the same three broad categories of vehicles used in the ACT Regulation (Class 2b-3 pickup trucks and vans, Class 4-8 rigid and Class 7-8 tractor trucks) to align with other U.S. jurisdictions and provide flexibility for manufacturers to begin selling ZEVs in classes where they are most cost competitive today;
        - Prioritize a review of available zero-emission technology for the Class 7-8 tractor truck segment and work to establish sales mandate targets for that vehicle class starting no later than model year 2026.

    - Prioritize technology demonstrations and pilots that evaluate the opportunities and challenges zero-emission technologies for the Class 7-8 tractor truck segment face.
- Establish penalties and enforcement mechanisms;

- Develop provisions that support compliance for manufacturers, such as credit banking and trading, and early credit generation policies.

2) **Data gathering activities:**
    - **Fleet reporting requirements:** In line with California's ACT regulation, require a one-time fleet reporting requirement, to develop a comprehensive set of data, including the specific types, duty-cycles, operational profiles and emissions from MHDVs in Canada.[1]

    - **Infrastructure assessments:** Conduct detailed, mode-specific infrastructure assessments of the refueling and charging infrastructure needs for each mode to inform deployment of infrastructure.

3) **Stronger, technology-forcing MHDV emission standards**: Canada must align with the most stringent heavy-duty GHG (greenhouse gas) emission standards in North America, whether at the state or federal level. Canada must ensure that any new GHG emission regulations for heavy-duty vehicles and engines both reduce tailpipe emissions, and achieve 100% (of selected categories) of ZE-MHDV sales by 2040, in line with Canada's commitments.[2]

4) **Demand-side measures:**
    - **Vehicle purchase incentives:** Introduce vehicle purchase incentives that are widely accessible, available upfront (i.e. point-of-sale vs. rebate or tax write-off), and of sufficient value to reduce the total cost of ownership (TCO) of ZE-MHDVs to below that of a similar diesel vehicle. These can be scaled down as TCO parity is reached in each vehicle segment.

    - **Infrastructure incentives and support:** Establish a ZE-MHDV infrastructure funding program that is accessible for both public and private infrastructure projects within fleet operations, and can be used to support the deployment of technology for pilots and demonstrations of emerging ZE-MHDVs. This could take the form of a separate MHDV stream within the existing Zero-Emission Vehicle Infrastructure

[1] As part of the 2020 "Advanced Clean Trucks" regulation, California established a one-time reporting requirement for large entities and fleets. The reporting requirement applied to all fleets with a vehicle that was over 8,500 GVWR (Class 2B-Class 8) and was passed to help to collect information about how vehicles are being operated by individual fleets and entities. The information is necessary to determine where zero-emission vehicles are suitable now, what the barriers are and what vehicle characteristics are necessary to meet different fleet needs.
[2] Canada to launch consultations on new climate commitments this month, establish Emissions Reduction Plan by the end of March 2022. Canada.ca

(ZEVIP) and Electric Vehicle and Alternative Fuel Infrastructure Deployment programs, or a new program that is developed to better serve MHDV fleets.

- **Electric utility upgrades**: Work with and financially support provinces, municipalities, and utilities to ensure grid readiness and deployment of public and private charging infrastructure. This measure should be prioritized given the long timelines for infrastructure upgrades.

- **Education and awareness**: Fund programs and work with industry associations to help educate fleet operators on infrastructure needs, how charging impacts business operations, vehicle availability, navigating government and utility incentive programs, understanding and engaging with new procurement processes, and assessing the TCO and economic viability of ZE-MHDVs. Given the prevalence of small fleet operators in Canada, education and awareness programs must be designed to work for them.

5) **Retrofits for existing fleets:**
   - **Stronger technology-specific regulations in addition to stronger, technology-forcing MHDV emission standards.** Strengthen existing or create new enhanced regulations targeting specific technology solutions (tire pressure systems, aerodynamic design, etc.).

   - **Stronger technology-forcing heavy-duty GHG emissions standards.** Canada should work with U.S. jurisdictions to align heavy-duty GHG emission standards with the objective of 100% ZE-MHDV sales by 2040. The creation of stronger technology-forcing standards under the heavy-duty GHG emission standards will help drive the deployment of zero-emission technology in existing fleets.

   - **Leverage the Green Freight Assessment program.** The Green Freight Assessment Program should be refunded but its scope narrowed to focus on segments that have a longer timeline for widespread ZEV deployment.

6) **Coordination:**
   - **Aligning action across jurisdictions.** Establish working groups with provinces and utilities early on to coordinate policy, regulations, infrastructure deployment, and incentives.

Responses to questions

1. Canada has historically aligned its heavy-duty vehicle GHG regulations with those of the U.S. Environmental Protection Agency. What will be the challenges and the benefits of also aligning with the sales targets in the California ACT?

Benefits from aligning with California's ACT regulation:

- **Avoid reinventing the wheel.** Canada can leverage the work California has already put into designing sales mandate targets by adopting identical targets. The vast majority of MHDVs in Canada operate within urban centres and face similar opportunities and challenges that informed the rules being adopted by U.S. states. Furthermore, every U.S. state to date that has adopted the ACT regulations has also adopted the identical sales targets. This includes jurisdictions operating in climates similar to those that would be experienced in most major urban centres in Canada, such as New York and Massachusetts.

- **Aligning with leading North American jurisdictions.** At least 15 states, together representing nearly 50% of the U.S. economy and nearly 40% of goods moved by truck, have signed a Memorandum of Understanding agreeing to work together to accelerate the uptake of ZE-MHDV, and committing to targets of 30% new ZE-MHDV sales by 2030 and 100% by 2050.[3] To-date, five of these states (in addition to California) have gone further and adopted sales mandates modeled after California's ACT regulation, including Oregon, Washington, New York, New Jersey, and Massachusetts. [4]

- **Provides market certainty and supports longer term investments in ZE-MHDVs.** A ZE-MHDV sales mandate provides market certainty for industry and drives the technology investments we need manufacturers to be making today to get us to 100% ZE-MHDV sales by 2040 and net-zero emissions by 2050.

- **Capturing ZE-MHDV supply in Canada.** Manufacturers will prioritize markets where they are required to sell zero-emission vehicles. Roughly 42% of all zero-emission buses and trucks sold in the U.S. and Canada to date have gone to California, the first state to implement a ZE-MHDV sales mandate.[5] Moving forward with a similar sales mandate in Canada will ensure manufacturers prioritize the Canadian market when deciding where to sell their ZE-MHDVs.

[3] https://www.nescaum.org/documents/mhdv-zev-mou_12-14-2021.pdf/
[4] https://www.bloomberg.com/news/articles/2022-01-06/how-zero-emission-laws-will-reshape-u-s-trucking
[5] https://theicct.org/publication/zero-emission-bus-and-truck-market-in-the-united-states-and-canada-a-2020-update/

Challenges that Canada will need to address in order to effectively align with the sales targets of the California ACT:

- **Insufficient complementary policies.** A sales mandate is a vital piece of the comprehensive approach California has taken to accelerate the deployment of ZE-MHDVs.[6] These supporting measures—particularly vehicle incentives, infrastructure deployment, and data—are critical to ensuring the sales mandate is successful. As Canada works to establish targets and an accompanying sales mandate, it must develop and implement complementary policies as well. See responses to Question 9 (demand-side measures) and Question 23 (technology and data) below for further detail.

- **Smaller ownership models.** A large percentage of the MHDV sector in Canada is represented by small fleet owners and operators who have limited capacity to consider and integrate new technologies. The federal government must provide educational resources and capacity support to assist these fleet managers in transitioning to ZEVs.

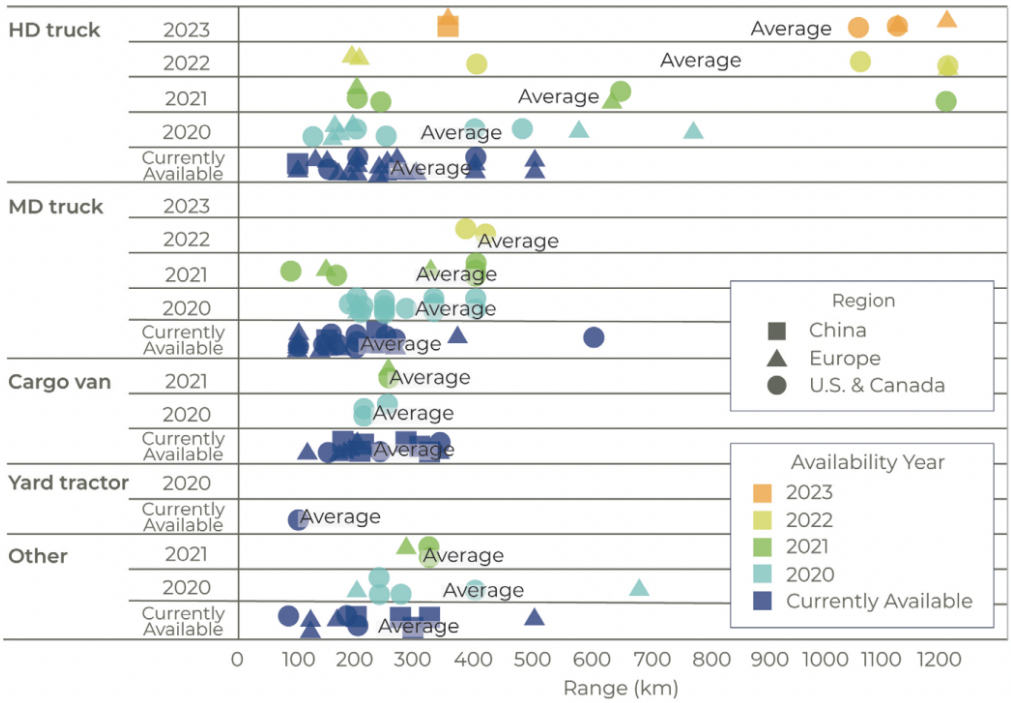
- **Lack of data.** While some data concerning vehicle emissions intensity and vehicle registrations exists in Canada, comprehensive data regarding the duty-cycle and specific operations of MHDVs in Canada is limited, creating a major barrier to effective policy design.

- **Unique Canadian factors affecting Class 7-8 tractor trucks.** Most Class 2b-8 vehicles operating in Canada face many of the same opportunities and challenges as those operating in the United States; however, Class 7 and 8 tractor trucks must account for unique Canadian characteristics.[7] For instance, a colder climate, longer travel distances and use of heavier vehicles will impact how quickly existing ZE-MHDV technology can be deployed in these vehicle classes, as well as which technologies (i.e. battery electric vs. hydrogen fuel cell) are most effective.

2. What classes and uses of HDV are now technically ready, or close to being ready, for adoption and an HDZEV-specific sales requirement? What criteria should go into that assessment of readiness? What is the lead time that would be appropriate for those classes? What other elements or measures are required to enable a swift transition to HDZEVs over the coming decades and meet our climate change commitments? What regulatory flexibilities would ease the transition?

As CALSTART has shown, **there are existing electric vehicles commercially available in all vehicle segments**, with new models arriving every year.[8] The graph below, provides a snapshot of the market in 2019.

[6] https://www.transportpolicy.net/standard/california-heavy-duty-zev/
[7] https://theicct.org/publication/analysis-of-heavy-duty-vehicle-fuel-efficiency-technology-uptake-in-california-and-canada/
[8] MOVING ZERO-EMISSION FREIGHT TOWARD COMMERCIALIZATION



Moreover, analysis conducted by the California Air Resources Board and confirmed by other independent studies indicates that **electric vehicle technology will be able to compete with diesel trucks in nearly every class from a TCO perspective without incentives by the end of this decade.**[9]

The primary measure required to enable a swift transition to ZE-MHDVs and meet Canada's climate change commitments is to establish a sales mandate.

As previously stated, for the vast majority of vehicle segments, Canada can leverage the work California has already put into designing sales mandate targets by adopting identical targets. However, Canada should consider regulatory flexibility for Class 7-8 tractor trucks to account for unique Canadian characteristics.[10] For instance, Canada's colder climate, longer travel distances and use of heavier vehicles will impact how quickly current ZE-MHDV technology can be deployed in this segment. To address this challenge, Canada should:

- Prioritize a review of available zero-emission technology for this segment and work to establish sales mandate targets starting no later than model year 2026.

- Prioritize technology demonstrations and pilots that evaluate the opportunities and challenges faced by zero-emission technologies for the Class 7-8 tractor truck segment.

[9] https://ww2.arb.ca.gov/sites/default/files/2021-08/210909costdoc_ADA.pdf; https://caletc.com/assets/files/ICF-Truck-Report_Final_December-2019.pdf
[10] https://theicct.org/publication/analysis-of-heavy-duty-vehicle-fuel-efficiency-technology-uptake-in-california-and-canada/

Despite the need for additional information, it's critical that Canada acts urgently to establish a sales target for this segment. Class 7-8 tractor trucks are responsible for a significant portion of MHDV-related GHG emissions.[11]

The sales mandate should include the following measures:

- Establish penalties and enforcement mechanisms;

- Develop provisions that support compliance for manufacturers, such as credit banking and trading, and early credit generation policies.

In addition to this mandate, Canada must move forward with the complementary measures described in response to Question 7 and 9 below.

7. What are the key near-term measures that should be adopted to increase the Canadian supply of HDZEVs? If your organization produces or uses HDZEVs, address the types of vehicles that your organization produces or uses.

Sales mandate: See response to Question 2 above for further details on how this policy should be designed.

GHG emission standards are an important near term measure to increase the supply of Canadian HDZEVs. As both Canada and the U.S. look to update their emission standards for model year 2027 and beyond, Canada should align with the most stringent heavy-duty GHG emission standards in North America, whether at the state or federal level. Canada should ensure that any new GHG emission regulations for heavy-duty vehicles and engines both reduce tailpipe emissions and achieve 100% (of selected categories) of ZE-MHDV sales by 2040, in line with Canada's commitments.[12]

To accomplish this, Canada must develop more aggressive technology-forcing standards that establish requirements based on the best zero-emission technology expected to be available in future years, and are aligned with our goals for ZE-MHDV deployment. This approach incentivizes innovation while providing sufficient lead time for technologies to be proven. It also accelerates the deployment of cost-effective zero-emission technology, instead of only relying on incremental improvements to existing technologies.

In the short term, well-designed heavy-duty GHG emission standards and the creation of stronger technology-forcing standards can also be an effective tool to help drive the adoption of cleaner technologies within existing fleets. The priority must be to ensure any after-market retrofits are

[11] https://theicct.org/sites/default/files/publications/ZETractorTrailers%20Working%20Paper042019.pdf
[12] Canada to launch consultations on new climate commitments this month, establish Emissions Reduction Plan by the end of March 2022. Canada.ca

targeted at segments that do not have immediate opportunities for cost-effective ZEV deployment, with a particular focus on Class 7-8 tractor trucks.

9. What are the key near-term measures that should be adopted to increase the Canadian demand for HDZEVs? If your organization produces or uses HDZEVs, address the types of vehicles that your organization will produce or use.

The MHDV sector will require a much broader suite of incentives to effectively accelerate ZEV deployment than is required in the light-duty vehicle sector. The following are some of the key near-term measures Canada must adopt to increase demand.

Vehicle incentives: Introduce an incentive program that is widely accessible across vehicle classes and available upfront (i.e. point-of-sale vs rebate or tax write-off). Incentives must be of sufficient value to reduce the TCO of ZE-MHDVs to below that of a similar diesel vehicle in the short term. Incentives can be scaled down as TCO parity is reached in each vehicle segment.

From a fleet owner perspective, point-of-purchase incentive programs are preferable to tax credits or rebates, as they lower the quantity of upfront capital a fleet is required to have, increasing the accessibility of the program.[13] This is particularly important for smaller fleets. Recent analysis of U.S. subsidies for electric buses and freight trucks by Resources for the Future found that:[14]

- Barring subsidies in the short term, ZEV adoption is unlikely to reach levels necessary to achieve meaningful GHG reductions and sales targets;

- Different vehicles face different costs, which has impacts on the effectiveness of financial incentives;

- As costs come down, it will be critical to evaluate the utility of incentives being offered, and adjust the policy design to target vehicle segments that are proving harder to reach TCO parity.

To date, the primary incentive program the Government of Canada has developed for increasing the uptake of ZE-MHDVs is a tax write-off for business investments in eligible ZE-MHDVs of up to 100%.[15] No public analysis could be found documenting the levels of uptake or effectiveness of this program, **but a review of the available literature on incentive programs, as well as studying the lessons from other jurisdictions, suggests that this program will be insufficient to accelerate the uptake of ZE-MHDVs.**

Infrastructure incentives and deployment: Establish a ZE-MHDV infrastructure funding program that is accessible for both public and private infrastructure projects within fleet operations, and

[13] https://globaldrivetozero.org/site/wp-content/uploads/2020/12/Moving-Zero-Emission-Freight-Toward-Commercialization.pdf
[14] https://media.rff.org/documents/IB_22-1.pdf
[15] Expanding Tax Support for Business Investment in Zero-Emission Vehicles - Canada.ca

can be used to support the deployment of technology for pilots and demonstration projects of emerging ZE-MHDVs. This could take the form of a separate MHDV stream within the existing ZEVIP and Electric Vehicle and Alternative Fuel Infrastructure Deployment programs, or a new program that is developed to better serve MHDV fleets.

The availability of charging and refueling infrastructure is one of the most significant barriers to widespread ZEV adoption in the MHDV sector.[16] Infrastructure deployment must go hand in hand with the deployment of ZE-MHDVs. While the availability of cheaper electricity is one of the major cost savings from a TCO perspective for fleet owners, the need for infrastructure upgrades at facilities—as well as the new operational processes to use them effectively—can be a major cost barrier.

Infrastructure is built into the TCO calculations and used to determine the viability of ZE-MHDVs, making government support for its deployment essential. The International Council for Clean Transportation estimates that infrastructure costs can add more than $70,000 per battery electric long-haul-trailer, and more than $25,000 per delivery truck, amounting to 7%-9% of life operating costs.[17] The exact ratio of charge points required per vehicle varies from a 1:1 ratio to 0.5:1, depending on truck type and scale of deployment of ZE-MHDVs.[18]

Different vehicle segments will have different needs when it comes to infrastructure. Battery electric technology is increasingly seeing deployment in the commercial vehicle space, and is well-suited to many of the short, consistent duty cycles of vehicles in the class 2b-6 vehicle segments, in particular urban and regional delivery.[19] For a majority of these vehicles, it is anticipated that there will be a high reliance on overnight depots using privately controlled infrastructure.[20]

One area where public infrastructure will play a larger role is in the Class 7-8 tractor truck segment in long haul-operations. A network of public infrastructure will be necessary along trucking corridors in order to ensure cost-effective operation of ZE-MHDVs as a result of the longer distances travelled by these vehicles, as well as their heavier loads.[21] At this point it's unclear which technology will see the greatest uptake in the long-distance trucking segment; battery-electric technology faces greater challenges in Canada given the colder climate, heavier loads, and longer distances traveled by these vehicles.[22] As a result, hydrogen technology is seen as a potentially cost effective solution for this vehicle segment, so long as the lack of infrastructure, high vehicle cost, and high cost for renewable hydrogen can be addressed.[23] In the near term, the federal government will need to work with private sector stakeholders to

[16] https://www.nrdc.org/experts/miles-muller/ca-approves-new-rules-support-ev-charging-infrastructure
[17] https://theicct.org/publication/estimating-the-infrastructure-needs-and-costs-for-the-launch-of-zero-emission-trucks/
[18] Ibid.
[19] https://nacfe.org/wp-content/uploads/edd/2018/04/NACFE_CBEV_FULL_050118.pdf
[20] https://www.mckinseyenergyinsights.com/insights/new-reality-electric-trucks-and-their-implications-on-energy-demand/; https://nacfe.org/emerging-technology/electric-trucks-2/amping-up-charging-infrastructure-for-electric-trucks/
[21] https://theicct.org/wp-content/uploads/2021/12/ze-tractor-trailer-fleet-us-hdvs-sept21.pdf
[22] https://theicct.org/wp-content/uploads/2021/06/ZETractorTrailers-Working-Paper042019.pdf
[23] https://theicct.org/sites/default/files/publications/Zero-emission-freight-trucks_ICCT-white-paper_26092017_vF.pdf

ensure the adequate deployment of public charging and refuelling infrastructure to support on road pilots of different technologies.

California has developed a new energy infrastructure incentive program to complement their vehicle incentives, which provides funding for electric vehicle charging and hydrogen refuelling infrastructure for ZE-MHDVs.[24] While Canada has created the ZEVIP, this program has largely focused on passenger vehicles to date.[25] A separate stream within one of Natural Resources Canada's existing charging infrastructure programs or a new program must be developed to better serve MHDV fleets, taking the challenges and opportunities described above into account.

Electric utility upgrades: Work with, and financially support provinces, municipalities, and utilities to ensure grid readiness and deployment of public and private charging infrastructure. This measure should be prioritized given the long timelines for infrastructure upgrades.

Utilities will play a critical role to play in supporting the deployment of private charging infrastructure and helping reduce the TCO for MHDVs using battery technology through the use of low and off-peak rate periods and other demand charges.[26] They can also play a role in supporting market education and outreach to customers, ensuring vehicle operators understand rate-design optimizations and starting on infrastructure upgrades as early as possible given the long timeline service upgrade can take.[27]

As an example, California works with utilities to help them cover much of the cost of installing electric infrastructure (transformers, conduits and cables) that charging infrastructure will rely on, further reducing the costs on truck owners.[28]

Education and outreach: Finally, the federal government must play a role in the education of and outreach to fleet operators to help them assess infrastructure needs, ensuring awareness of government and utility financial incentives, as well as best practices for fleets incorporating charging needs into vehicle and fleet operations.

12. Generally, what are the key hurdles you see to transitioning the fleet to HDZEVs in the coming decades, and how can these be overcome? What are the key opportunities and how can these be captured?

Key hurdles to transitioning the fleet to HDZEVs in the coming decades include:

Complex infrastructure needs. Accelerated ZE-MHDV uptake will depend on the successful deployment of both public and private charging/refuelling infrastructure, which faces a number of

[24] https://www.energy.ca.gov/proceedings/energy-commission-proceedings/energy-infrastructure-incentives-zero-emission-commercia
[25] https://www.nrcan.gc.ca/energy-efficiency/transportation-alternative-fuels/zero-emission-vehicle-infrastructure-program/21876
[26] https://caletc.com/assets/files/ICF-Truck-Report_Final_December-2019.pdf
[27] https://www.nj.gov/bpu/pdf/MHD%20EV%20Stakeholder%20Aug%2024.pdf
[28] https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M413/K061/413061495.PDF

challenges. First, infrastructure deployment will require coordination between all levels of government, as well as with utilities and fleet owners. Second, electric utility companies will need support developing the capacity to quickly and affordably deploy the necessary charging infrastructure and related grid upgrades. Third, the vehicle segments likely to transition to ZE-MHDVs first (e.g. Class 2b-7 vehicles) will rely more heavily on private charging infrastructure, which is not currently eligible for any federal funding programs. Finally, ZE-MHDV Class 7-8 tractor trucks used in long-haul delivery will rely on a robust network of both private and public charging and refueling stations. However, levels of deployment to date are low and financial incentives to support the faster buildout of this public infrastructure are insufficient.[29]

To overcome these hurdles, we recommend the federal government:

- Establish working groups with provinces and utilities early on to coordinate policy, regulations, infrastructure deployment and incentives.
- Establish a ZE-MHDV infrastructure funding program that is accessible for both public and private infrastructure projects within fleet operations, and can be used to support the deployment of technology for pilots and demonstrations of emerging ZE-MHDVs. This could take the form of a separate MHDV stream within one of Natural Resources Canada's existing charging infrastructure programs or a new program that is developed to better serve MHDV fleets.

Higher upfront costs. The wide scale deployment of ZE-MDHVs depends on zero-emission technologies reaching cost-parity with existing diesel and gasoline technologies. While this is expected to occur for the majority of vehicle segments by 2030, it is contingent on accelerated deployment in the near term, which helps drive down the cost of batteries and fuel cell technology.

To overcome this hurdle, we recommend the federal government:

- Implement a comprehensive suite of policies to accelerate the deployment of ZE-MHDVs, including introducing upfront purchase incentives that are widely accessible, available upfront (i.e. point-of-sale vs. rebate or tax write-off), and of sufficient value to reduce the TCO of ZE-MHDVs to below that of a similar diesel vehicle.

- Establish a sales mandate that sets clear targets for all vehicle classes starting with model year 2025 and aligning those targets with the California ACT Regulation, accelerating the supply of ZE-MHDVs coming to market.

Fleet owners and operators face multiple types of costs in adopting ZEVs. While the direct vehicle and associated infrastructure costs are relatively well understood, operators will face a number of additional real and perceived costs that will act as a barrier to ZE-MHDV deployment. These include: changes in operational practices; permitting and approvals; development of new processes for maintenance; costs associated with financing technology that has not had a long

[29] https://theicct.org/wp-content/uploads/2021/12/ze-tractor-trailer-fleet-us-hdvs-sept21.pdf

track record; psychological or practical costs associated with a lack of capacity (especially in small operators) to evaluate new technology and plan new processes; and inertia in existing procurement processes.[30]

To overcome these hurdles, we recommend the federal government:

- Ensure adequate stakeholder engagement throughout the policy design process and establish education and awareness programs that help support fleets navigate the ZEV transition.

15. Is the lack of public charging/refuelling infrastructure a barrier to the adoption of HDZEVs in your community or business? How can that be addressed?

See response to question 9 regarding "Infrastructure incentives and deployment."

17. What type of financing would allow you to adopt HDZEVs by covering the higher upfront costs of HDZEV vehicles and charging infrastructure? For example, would you use loans paid back from reduced operating and maintenance costs?

See response to question 9 under "vehicle incentives" and "infrastructure incentives and deployment".

18. What benefits do you see to implementing HDZEVs, such as cleaner air and better working conditions?

Implementing HDZEVs offers a range of benefits, including:

- **Reduced emissions through the accelerated deployment of ZEV.** Heavy-duty gasoline and diesel vehicles are responsible for over 9% of total national emissions and over 30% of transportation emissions.[31] Freight emissions are expected to surpass passenger-vehicle emissions by 2031.[32] The Government of Canada reports that the number of heavy-duty vehicles on our roads is increasing by about 2% per year, and has increased by over 57% since 2005.[33] A comprehensive approach that drives accelerated deployment of ZE-MHDVs will help to cut emissions in this high-pollution sector. Given the long capital lifetime of MHDV, every year of delay risks locking in decades more of internal combustion engine (ICE) powered-MHDVs on the roads, with their associated emissions.

- **Reduce illness and death-causing tailpipe emissions.** Health Canada estimates that 14,600 premature deaths were linked to air pollution in 2019.[34] Furthermore, a 2019

[30] https://www.edf.org/sites/default/files/documents/EDF_Financing_The_Transition.pdf
[31] https://publications.gc.ca/collections/collection_2021/eccc/En81-4-2019-1-eng.pdf
[32] Discussion paper on Heavy-duty vehicles and engines in Canada: transitioning to a zero-emission future. Canada.ca
[33] Ibid.
[34] https://www.canada.ca/en/health-canada/services/publications/healthy-living/2021-health-effects-indoor-air-pollution.html

study by the University of Toronto and the Southern Ontario Centre for Atmospheric Aerosol Research found that diesel trucks are responsible for a disproportionate amount of pollutants and are a major source of nitrogen oxides and black carbon.[35] Getting more Canadians in zero-emission vehicles would reduce local air pollutants, such as particulate matter and nitrogen oxides, since zero-emission vehicles produce no tailpipe pollution.

- **Cost savings for heavy-duty vehicle operators.** As the TCO for electric heavy-duty vehicles continues to drop, fleet managers and vehicle operators will be able to realize significant savings over the lifetime of the vehicle.[36]

- **Aligning with leading North American jurisdictions.** As the number of states implementing a sales mandate grows, the market shift will accelerate. By aligning our own standards and policies we will be integrating ourselves with jurisdictions that represent 50% of the U.S. economy and nearly 40% of goods moved by truck.[37]

- **Seize new opportunities for domestic manufacturing.** Canada ranks 15th in the world in heavy truck manufacturing and has seen its global production double between 2011 and 2018.[38] In 2020, Canada and the U.S. each captured roughly equivalent shares of zero-emission bus manufacturing, with approximately 86% of all zero-emission buses sold in either country originating from one of the two nations.[39] There are already a number of zero-emission heavy-duty vehicle manufacturers who already have a footprint in Canada, including Lion Electric, New Flyer, and Nova Bus. Implementing policies that grow the market for and increase the supply of ZE-MHDVs in Canada would support job growth in this sector and increase export opportunities for Canadian-made ZE-MHDVs.

22. What types of education and awareness programs, or activities for fleet owners and drivers, would be most effective in providing information and building confidence in these types of vehicles?

Education and awareness programs must focus on infrastructure needs, how charging impacts business operations, vehicle availability, navigating government incentive programs, understanding and engaging with new procurement processes, and assessing the TCO and economic viability of ZE-MHDVs. Given the prevalence of small fleet operators in Canada, education and awareness programs must be designed to work for them.[40]

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[35] Near-Road Air Pollution Pilot Study
[36] https://caletc.com/assets/files/ICF-Truck-Report_Final_December-2019.pdf
[37] https://www.dec.ny.gov/docs/air_pdf/mhdzevmou102120.pdf
[38] https://theicct.org/sites/default/files/publications/Canada-Power-Play-ZEV-04012020.pdf
[39] https://theicct.org/wp-content/uploads/2021/06/canada-race-to-zero-FS-may2021.pdf
[40] https://strategis.ic.gc.ca/app/scr/app/cis/businesses-entreprises/484#wb-cont

23. What technologies and research gaps regarding vehicle and fuelling infrastructure do you see as a priority?

The largest gap in technology and research is data. Adequate data is critical for effective policy design and ZE-HDV rollout. Infrastructure build outs will be unnecessarily costly without careful planning and coordination.[41] To address gaps in data, the federal government must require:

- **Fleet reporting requirements**: In line with California's ACT regulation, require a one-time fleet reporting requirement, to develop a comprehensive set of data, including the specific types, duty-cycles, operational profiles and emissions from MHDV in Canada.

- **Infrastructure assessments**: Conduct detailed, mode-specific infrastructure assessments of the refueling/charging infrastructure needs for each mode to inform government support for the deployment of infrastructure.

28. For the current on-road fleet, what role can aftermarket retrofits play to support and complement the broader effort towards decarbonizing on-road transportation? Ideally, how would such a program be designed?

See response to Question 7 regarding the heavy duty GHG emission standards, and how these can be used to integrate aftermarket retrofits and ZE-MHDV deployment objectives.

29. How can the Government work with industry to encourage the adoption of retrofits for the fleet of today without diverting investment decisions to HDZEV alternatives?

There are three primary tools to support the adoption of retrofits in fleets:

- **Stronger technology-specific regulations.** Strengthening existing or creating new enhanced regulations targeting specific technology solutions (tire pressure systems, aerodynamic design, etc.) can encourage retrofits and reduce on-road vehicle emission intensity.

- **Stronger technology-forcing heavy-duty GHG emissions standard.** Canada should work with U.S. jurisdictions to align heavy-duty GHG emission standards with the objective of 100% ZE-MHDV sales by 2040. The creation of stronger technology-forcing standards under the heavy-duty GHG emission standards will help drive the deployment of zero-emission technology in existing fleets. For additional information on the heavy duty GHG emission standards, see response to Question 7.

- **Continue funding the existing Green Freight Assessment program but narrow the program's focus.** The Green Freight Assessment Program should be refunded but its scope narrowed to focus on segments that have a longer timeline for widespread ZEV deployment. This

[41] https://theicct.org/publication/estimating-the-infrastructure-needs-and-costs-for-the-launch-of-zero-emission-trucks/

will ensure that retrofits maximize near-term emission reduction, without competing with the deployment of ZE-MHDVs.

We thank you for the opportunity to respond to this consultation, and would be pleased to answer questions or discuss our recommendations further.

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